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SAFE HANDLING AND STOWAGE OF CONTAINERS

Guidelines for the packaging and stowing of cargo in freight containers, swap-bodies and vehicles and for the handling and securing of containers

Note by the secretariat

A. MANDATE

With a view to developing a single compendium containing rules for the stowing and securing of cargo in containers for the entire transport chain (rail, road, sea, inland water transport), the ECE Working Party had at previous sessions considered using the IMO/ILO Guidelines for the Packing of Cargo in Freight Containers or Vehicles as a basis and had approved in principle the outline of such a single compendium (TRANS/WP.24/R.33; TRANS/WP.24/47, paragraphs 57-59; TRANS/WP.24/49, paragraphs 58 and 59; TRANS/WP.24/59, paragraphs 47 and 48).

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The ECE Inland Transport Committee, at its fifty-fourth session, had emphasized the importance it attached to this activity (ECE/TRANS/94, paragraph 94).

The Working Party may wish to consider a first draft of such guidelines, prepared by the secretariat, and provide guidance on its scope and content.

This draft is based on the IMO/ILO Guidelines for the Packing of Cargo in Freight Containers or Vehicles. Any additions to the IMO/ILO guidelines are marked in bold font.

Document TRANS/WP.24/R.69 containing an earlier unedited version of these guidelines (in English only) is replaced by the present document.

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Draft

**GUIDELINES FOR THE PACKING AND STOWING OF CARGO
IN FREIGHT CONTAINERS, SWAP-BODIES AND VEHICLES
AND FOR THE HANDLING AND SECURING OF CONTAINERS**

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in cooperation with the
International Maritime Organization (IMO)
and the
International Labour Office (ILO)

CONTENTS

Preamble

Scope

1	General conditions
2	Visual inspections prior to packing
2.1	Exterior inspection
2.2	Interior inspection
3	Stowage planning, packing and securing of cargo
3.1	Before packing
3.2	Packing and securing
3.3	On completion of packing
4	Additional advice on stowage planning, packing and securing of dangerous goods
4.1	General
4.2	Before packing
4.3	Packing and securing
4.4	On completion of packing
5	Advice on receipt of containers or vehicles
6	Basic principles for the safe handling and securing of containers
6.1	General
6.2	Lifting
6.3	Containers on ground
6.4	Containers on vehicles
Annex 1	Condensation
Annex 2	Labels, placards and marine pollutant mark
Annex 3	Measures to prevent overloading of containers
Annex 4	List of competent international organizations
Appendix	Illustrations on "DO" and "DON'T"

**GUIDELINES FOR THE PACKING AND STOWAGE OF CARGO
IN FREIGHT CONTAINERS, SWAP-BODIES OR VEHICLES
AND ON THE HANDLING AND SECURING OF CONTAINERS**

Preamble

While the use of freight containers, **swap-bodies**, vehicles or other cargo transport units substantially reduces the physical hazards to which goods are exposed, improper or careless packing or loading of goods into such units, or lack of proper blocking, bracing and securing, may be the cause of personnel injury when they are handled or transported; in addition, serious and costly damage may occur to the goods inside or to the equipment. The person who packs goods and secures them in the container, **swap-body** or vehicle [for export **or for domestic transport**] may be the last person to look inside the unit until it is opened by the consignee at its final destination.

Consequently, a great many persons will rely on his skill, including:

- road vehicle drivers and other highway users when the unit moves by road;
- rail workers, and others, when the unit is carried by rail;
- **crew members of inland waterway vessels when the unit is transported on inland waterways;**
- **handling staff at inland terminals when the unit is transferred from one transport mode to another;**
- dock workers when the unit is loaded or discharged;
- crew members of the ship which may be taking the unit through its most difficult conditions during the transport operation; and
- those who unpack the unit.

All persons such as the above may be at risk from a poorly packed container, **swap-body** or vehicle, in particular one which is carrying dangerous goods.

Scope

This publication is intended as a short guide to the essentials of safe packing for use by those responsible for the packing and securing of cargo in freight containers, **swap-bodies**, vehicles or other cargo units and by those whose task it is to train people to pack those units. Such training is essential if safety standards are to be maintained.

This publication is not intended to conflict with, or to replace or supersede any existing regulations or recommendations which may concern the carriage of cargo in containers or vehicles. It does not cover the filling or emptying of tank containers, portable tanks or road tank vehicles, the transport of bulk cargo in dry freight containers or refrigerated cargo.

For the purposes of these Guidelines, a freight container is defined as an article of transport equipment that is of a permanent character and accordingly strong enough to be suitable for repeated use. It is designed to transport a number of packages or units together from the loading point to the destination by road, rail, **inland waterway** and sea without intermediate separate handling of each package or unit.

For the purposes of these Guidelines, a swap-body is defined as a loading unit designed especially for combined road-rail transport which is generally, particularly if loaded, not stackable. Any further reference to loading and stowing of cargo in containers refers also to swap-bodies.

The advice given in these Guidelines refers to the packing of goods in containers, but it should be noted that much of the advice applies equally to vehicles which are to make a roll-on/roll-off voyage.

In these Guidelines, the advice on package and packaging refers to individual items of cargo. Packing denotes the placing of receptacles, packages or units in a container or vehicle. Stowage denotes the loading and the positioning of a container or vehicle aboard a ship or of cargo in a container or vehicle.

1 GENERAL CONDITIONS

1.1 Sea voyages are made in a variety of weather conditions likely to exert a combination of forces upon the ship and its cargo. These will give rise to pitching, rolling, heaving, surging, yawing or swaying or a combination of two or more. Such movements can exert forces on the cargo greater than those usually found ashore and may exert them over a prolonged period.

1.2 Packing and securing of cargo inside a container or vehicle should be carried out with this in mind. It should never be assumed that the weather will be calm and the sea smooth or that securing methods used for land transport will always be adequate at sea.

1.3 During longer voyages, climatic conditions are likely to vary considerably with possible effect on the internal conditions of a container which may give rise to condensation (sweating)^{1/} on cargo or internal surfaces. Where cargo is liable to damage from such cause, expert advice should be sought.

1.4 Compared to sea voyages, road and rail transport operations will normally not generate such heavy forces upon the cargo and the container. Nevertheless, road transport causes vibrations that may vary considerably due to different suspension systems, different road surface conditions and different driving habits.

1.5 Rail transport may also generate forces exerted by vibrations. In addition, rail transport may lead to heavy shocks as a result of shunting operations. Most railways have organised their operations in such a way as to avoid shunting of railway wagons incurring high forces (e.g. by operating dedicated block trains for container transport) or by moving freight containers on wagons with high performance shock absorbers that are normally able to reduce shunting shock forces from 4 g to 1 g. It may be advisable to ensure that such operational features have been established for the rail journey.

1.6 Inland waterway transport is most likely to be extremely smooth. It will not exert any forces higher than those of road transport to the cargo and the container. Diesel engines of inland waterway vessels will create some low frequency vibrations which under normal conditions should not give reason for any concern.

^{1/} See annex 1.

1.7 The following table provides some details on shock and vibration forces which could arise during rail and road transport operations:

Mode of transport	Max. vibrations	Max. vibrations	Max. shocks
	Hz	Hz	g
Rail	800	16-350	1.0
Road	500	10-20	0.4-4.5 ^{*/}

^{*/} This value may vary greatly, depending on the type of equipment and suspension.

1.8 Considerable forces will also be exerted on freight containers and its cargo during terminal transfer. Especially in sea-ports, containers are transferred by shore-side gantry cranes that lift and stop containers applying considerable acceleration forces creating pressure on the packages in containers. Front lift truck may take containers, lift them, tip them and move them across the terminal ground.

2 VISUAL INSPECTIONS PRIOR TO PACKING

A container should be inspected inside and outside before it is packed with cargo. The following may be used as a guide to inspecting a container before packing but is only partially relevant to vehicles.

2.1 EXTERIOR INSPECTION

2.1.1 The structural strength of a container depends to a great extent on the integrity of its main framework comprising the corner posts, corner fittings, main longitudinal and the top and bottom end transverse members which form the end frame. If there is evidence that the container is weakened, it should not be used.

2.1.2 Walls, floor and roof should be in good condition, and not significantly distorted.

2.1.3 Doors should work properly and be capable of being securely locked and sealed in the closed position, and properly secured in the open position. Door gaskets and weather strips should be in good condition.

2.1.4 A container should bear a current International Convention for Safe Containers (CSC)^{1/} Safety Approval Plate. **A swap-body should have a yellow code plate, fixed at its side wall (for details see UIC leaflet 596^{2/}) which proves that it has been codified in conformity with the safety rules of European railways. Such swap-bodies need not be equipped with a CSC plate, but many of them will have one in addition to the yellow code plate. European domestic containers are marked in a similar way as ISO freight containers (ISO 6346)^{3/} and carry a CSC approval plate.**

2.1.5 Irrelevant labels, marks or placards should be removed or masked.

2.1.6 A vehicle should be provided with points for securing it aboard ships (refer to IMO Assembly Resolution A.581(14) of 20 November 1985 on "Guidelines for securing arrangements for the transport of road vehicles on ro-ro ships", contained in the Appendix to the Supplement to the IMDG Code^{4/})

2.1.7 When tilts or canvas covers are to be used, they should be checked as being in satisfactory condition and capable of being secured. **Loops or eyes in such canvas to take the fastening rope as well as the rope itself must be in good condition.**

2.1.8 When loading swap-bodies, it should be borne in mind that the bottom and floor construction of swap-bodies are, in most cases, the main areas of structural strength.

^{1/} International Convention for Safe Containers (CSC) administered by the International Maritime Organization IMO).

^{2/} International Union of Railways (UIC).

^{3/} International Organization for Standardization (ISO).

^{4/} International Maritime Dangerous Goods Code administered by the IMO.

2.2 INTERIOR INSPECTION

2.2.1 A container should be weatherproof unless it is so constructed that this is obviously not feasible. Previous patches or repairs should be carefully checked for possible leakage. Potential points of leakage may be detected by observing if any light enters a closed container. In carrying out this check, care should be taken to ensure that no person becomes locked inside a container.

2.2.2 A container should be free from major damage, with no broken flooring or protrusions such as nails, bolts, special fittings, etc. which could cause injury to persons or damage to the cargo.

2.2.3 Cargo tie-down cleats or rings where provided should be in good condition and well anchored.

2.2.4 A container should be clean, dry and free of residue and persistent odours from previous cargoes.

2.2.5 A folding container or other container with movable or removable main components should be correctly assembled. Care should be taken to ensure that removable parts not in use are packed and secured inside the container.

3 STOWAGE PLANNING, PACKING AND SECURING OF CARGO

3.1 BEFORE PACKING

3.0. Before loading a container, careful consideration should be given as to how the container will be presented during the loading operation. The same applies for unloading. The container may be presented for loading or unloading as follows:

- loaded on a semi-trailer chassis together with a truck;
- loaded on a semi-trailer chassis, but without truck;
- loaded on a rigid truck or chassis;
- standing on the ground;
- standing on its supporting legs (in case of Class C swap-bodies;
- loaded on a rail-car.

Any of these configurations are possible; the actual loading or unloading situation depends often on commercial considerations. However, whenever the container is presented on a chassis or on supporting legs, special care should be taken in planning the loading or unloading operation.

3.1.1 A container to be packed should rest on level and firm ground or on a rail-car or on a trailer. In the latter case, care should be taken to ensure the trailer cannot tip while being packed especially if a fork lift truck is being used. If necessary the trailer should be propped. Brakes should be securely applied and the wheels chocked.

3.1.1a Particular attention should be given if a swap-body standing on its supporting legs is loaded, particularly that the swap-body does not tip when a fork lift truck is used for loading. Furthermore, it should be ascertained that the supporting legs of the swap-body rest firmly on the ground and cannot shift, dump or move when forces are exerted to the swap-body during loading.

3.1.2 Stowage should be planned before packing is commenced. This should make it possible to produce either a tight or a secured stow, in which the compatibility of all items of cargo and the nature, i.e. type and strength, of any packages or packaging involved, are taken into account. The possibility of cross-contamination by odour or dust as well as physical or chemical compatibility should be considered.

3.1.3 The planned load should not weigh more than the payload of the container which is marked upon it. This ensures that the permitted maximum gross weight of the container on the CSC Safety Approval Plate^{1/} (which includes the payload) will never be exceeded (see also annex 3). **Since swap-bodies are not marked with their maximum permissible gross weight, tare weight or other features, any of these values should be known before loading commences. According to CEN standards^{2/}, a swap-body of class C (7.15 m - 7.82 m) will have a maximum gross mass of 16,000 kg and a swap-body of class A (12.2 m - 13.6 m) will have a gross mass of up to 32,000 kg.**

3.1.4 Notwithstanding the foregoing, any weight limitation along the projected route that may be dictated by regulations or other circumstances (such as lifting and handling equipment) should be complied with. Such limit may be considerably less than the permitted gross weight already referred to. In case of doubt, the container operator should be consulted.

3.1.5 Stowage planning should take account of the fact that containers are generally designed assuming the load to be evenly distributed over the entire floor area. Where substantial deviations from uniform packing could occur, specialist advice should be sought.

3.1.6 When a heavy indivisible load is to be shipped in a container or vehicle, due regard should be given to the localized weight bearing capability of the container. If necessary, the weight should be spread over a larger area than the actual bearing surface of the load, for example by use of bunks of timber.

3.1.7 In such a case the method of securing the load should be planned before packing occurs and any necessary preparations made.

^{1/} International Convention for Safe Containers (CSC) administered by the International Maritime Organization.

^{2/} European Standardization Committee (CEN).

3.1.8 If the planned load of an open-topped or open-sided container is to project beyond the container overall dimensions, special arrangements should be made. It should be borne in mind that road traffic regulations may not allow for such overhangs. Furthermore, in rail and inland waterway transport, containers are often loaded narrowly door-to-door and side by side not permitting any overhang.

3.1.9 When heavy cargo is to be shipped, if it is impracticable to place the centre of gravity in or near the centre of the horizontal plane of the container, or if it will be above the half height, the container operator should be consulted.

3.1.10 When planning the packing of a container, consideration should be given to potential problems which may be created for those who will unpack it.

3.1.11 Before a container is packed, it should be ensured that the loading personnel is fully informed about all risks and danger involved. As a minimum requirement some sketches showing the basic rules of container packing should be available. The present guidelines should also be readily available. If necessary, the shipper and the packing personnel have to consult each other regarding any special feature of the goods to be loaded into the container. In particular, information on possible hazardous goods should be considered very carefully in an appropriate way.

3.1.12 When loading a container or swap-body, the shipper should bear in mind that any failure to load and secure the cargo correctly may result in additional costs that he will have to bear: If, for example in railway transport, a container or swap-body is found not to be properly loaded and without proper load securing, the rail-car may be marshalled out of the train into a siding and the transport can only be continued once the load has been secured. The shipper will have to pay for these activities, especially for the loading and securing operation as well as for the additional time during which the rail-car has been used. In addition, he will be held responsible for the delay of the transport operation.

3.1.13 Not all handling vehicles are suitable for container loading. Fork lift trucks used for container loading (and discharging) should have a short lifting mast and a low driver's shelter coverage. If the fork lift truck operates for some time inside the container, a vehicle with electric power supply should be used. Container floors are built to withstand a maximum wheel pressure corresponding to an axle load of a fork lift truck of 2,730 kg. Such an axle load is usually found at fork lift trucks with a lifting capacity of 2.5 tonnes. If the container floor is at a different height level than the loading ramp, a bridging gear will need to be used. This will result in two sharp bends between the loading bridge and the ramp as well as between the loading bridge and the container floor. In such cases enough free wheel suspension height of the fork lift truck should be ensured so as not to touch ground when passing these bends.

3.2 PACKING AND SECURING

3.2.1 It is essential to make the cargo in a container or vehicle secure against any reasonably foreseeable movement. At the same time, the method of securing the cargo should not itself cause damage or deterioration either to the cargo or the container or vehicle.

3.2.2 Where goods of regular shape and size are concerned, a tight stow from wall to wall should be sought. However, in many instances some void spaces will occur. These can be tolerated if security is obtained by the frictional effect between adjacent packages. If there is an insufficient frictional effect, or if the spaces between the packages are too large, then the stow should be completed by using dunnage, folded cardboard, air bags or other suitable means.

3.2.3 If air bags are used, the manufacturer's instructions as to filling pressure should be scrupulously observed. Allowance should be made for the possibility of a considerable rise in the internal temperature of the container above the temperature at the time of packing which might cause the bags to expand and burst, thereby making them ineffectual as a means of securing the cargo. Air bags should not be used as a means of filling space at the doorway unless precautions are taken to ensure that they cannot cause the door to open violently when the locking bars are released (see also 3.3.1).

3.2.4 The cargo weight should be evenly distributed over the floor of a container or vehicle. Where cargo items of a varying weight are to be packed into a container or vehicle or where a container or vehicle will not be full (either because of insufficient cargo or because the maximum weight allowed will be reached before the container or vehicle is full), the stow should be so arranged and secured that the approximate centre of the weight of the cargo is close to the mid-length of the container or vehicle. In no case should more than 60 per cent of the load be concentrated in less than half of the length of a container measured from one end.

3.2.5 Heavy goods should not be placed on top of lighter goods and liquids should not be placed on top of solids. The centre of gravity should be below the half-height of a container.

3.2.6 In order to avoid cargo damage from moisture, wet cargoes, moisture inherent cargoes or cargoes liable to leak should not be packed with goods susceptible to damage by moisture. Wet dunnage, pallets or packaging should not be used. In certain cases, damage to equipment and cargo can be prevented by the use of protective material such as polythene sheeting.

3.2.7 Damaged packages should not be packed into a container or vehicle unless precautions have been taken against harm from spillage or leakage (see 4.2.4 for dangerous goods).

3.2.8 Permanent securing equipment incorporated in the design of a container should be used wherever necessary to prevent cargo movement.

3.2.9 Where open-sided vehicles are concerned, particular care should be taken to secure cargo against the forces likely to arise from the rolling of the ship. In other words, a check should be made to ensure that all side battens are fitted or other adequate precautions are taken.

3.2.10 Special instructions shown on packages, or otherwise available, should be followed, e.g.:

- goods marked "protect from frost" should be packed away from the walls of a container;
- goods marked "this way up" should be packed accordingly.

3.2.11 When deciding on packaging and load securing material, it should be borne in mind that countries enforce increasingly a garbage and litter avoidance policy; this might lead to limitations on the use of certain materials and imply fees for the recovery of packages at the reception point as well as similar problems for the consignee of the cargo. In such cases reusable packaging and securing material should be used.

3.3 ON COMPLETION OF PACKING

3.3.1 During the final stages of packing a container, care should be taken, so far as is practicable, to build a secure face of the cargo so as to prevent "fall out" when the doors are opened. Where there is any doubt as to the security of the cargo, further steps should be taken to ensure security by weaving strapping between securing points or placing timber between the rear posts.

Two factors should be borne in mind:

- that a container on a trailer usually inclines towards the doors;
- that a cargo may move against the doors due to jolts, etc. during **transport**.

3.3.2 If a container is destined for a country with wood treatment quarantine regulations, care should be taken that all wood in the container, packaging and cargo complies with the regulations. It has proved a useful practice to place a copy of the wood treatment certificate in a conspicuous place in the container.

3.3.3 After closing the doors, it must be ensured that all closures are properly engaged and secure. Usually a seal should be applied. Care should be taken that sealing procedures are carried out properly.

3.3.4 Where containers have fittings such as tilts or hatches, a check should be made that they are properly secured with no loose equipment likely to cause a hazard during **transport**.

3.3.5 When dry ice or other expendable refrigerant is used for cooling purposes, a warning label (examples of such warning labels are given in annex 2) should be posted on the outside of the doors so that it is clearly visible to any person operating the doors. The label should warn of the possibility of an asphyxiating atmosphere.

3.3.6 When a container or its contents has been fumigated and is to be shipped under fumigation, then a warning label (examples of such warning labels are given in annex 2) should be placed on the outside of the doors so that it is clearly visible to any person operating the doors. The label should state the method of fumigation employed and the date and time when it took place.

3.3.7 As containers offered for shipment under fumigation may require special precautions, they should only be accepted with the agreement of the carrier and they should be identified to him prior to loading.

Note: 3.3.6 and 3.3.7 do not apply to containers which have been fumigated, ventilated thereafter and certified as safe^{1/}.

4 ADDITIONAL ADVICE ON STOWAGE PLANNING, PACKING AND SECURING OF DANGEROUS GOODS

4.1 GENERAL

4.1.1 The recommendations of this section apply to containers or vehicles in which dangerous goods are packed. They should be followed in addition to the advice given elsewhere in these Guidelines.

4.1.2 International (often even national) transport of dangerous goods may be subject to several dangerous goods transport regulations depending on the destination and the modes of transport used.

4.1.3 For combined transport, involving several modes of transport, when transport by sea does not occur, the applicable rules and legislation depend on whether it is national movements or international transport or transport within a political or economic union or trading zone, such as the European Union.

^{1/} The Recommendations on the Safe Use of Pesticides in Ships in the Supplement to the IMDG Code give further useful advice.

4.1.4 International transport of dangerous goods by road, rail or inland waterways is subject to the following Agreements in Europe:

- European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR);
- Regulations Concerning the International Carriage of Dangerous Goods by Rail (RID);
- Regulations for the Carriage of Dangerous Substances on the Rhine (ADNR) based on the Recommendations contained in the European Provisions Concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN).

4.1.5 National rules, applicable to domestic transport, may differ from these international regulations. However, the provisions of the above international instruments (ADR, RID and ADNR) are harmonized. Most other national and international regulations are based on the United Nations Recommendations on the Transport of Dangerous Goods.

4.1.6 For maritime transport, the provisions of the International Maritime Dangerous Goods Code (IMDG)^{1/} apply. The IMDG Code provides detailed information on all aspects of the carriage of dangerous goods by sea. Special attention is drawn to:

- Section 12 of the General Introduction (freight container traffic);
- Section 17 of the General Introduction (carriage of dangerous goods on roll-on/roll-off ships)
- Section 14 of the General Introduction and Individual Schedules (Stowage on-board ships, including stowage of containers and vehicles)
- Section 15 of the General Introduction and Individual Schedules (segregation, including segregation of dangerous goods from each other inside cargo transport units and segregation of cargo transport units from each other on-board ships).

^{1/} International Maritime Dangerous Goods Code (IMDG Code) administered by the International Maritime Organization (IMO).

4.1.7 Dangerous goods are divided into the following classes according to their principal hazard:

- Class 1 - Explosives
- Class 2 - Gases: Compressed, liquefied or dissolved under pressure
- Class 2.1 - Flammable^{1/} gases
- Class 2.2 - Non-flammable gases
- Class 2.3 - Poisonous gases
- Class 3 - Flammable^{1/} liquids

For the stowage of cargo on-board ships this class is, in the IMDG Code, subdivided as follows^{2/}:

- Class 3.1 - Low flashpoint group
- Class 3.2 - Intermediate flashpoint group
- Class 3.3 - High flashpoint group
- Class 4 - Flammable solids or substances
- Class 4.1 - Flammable solids
- Class 4.2 - Substances liable to spontaneous combustion
- Class 4.3 - Substances which, in contact with water, emit flammable gases
- Class 5 - Oxidizing substances and organic peroxides
- Class 5.1 - Oxidizing substances
- Class 5.2 - Organic peroxides
- Class 6 - Toxic and infectious substances
- Class 6.1 - Toxic substances
- Class 6.2 - Infectious substances
- Class 7 - Radioactive materials
- Class 8 - Corrosives
- Class 9 - Miscellaneous dangerous substances and articles

^{1/} Flammable has the same meaning as inflammable

^{2/} Depending on the flashpoint group, cargo transport units may not be accepted on-board passenger ships.

Class 9 comprises

.1 substances and articles not covered by other classes which experience has shown, or may show, to be of a dangerous character; and

.2 environmentally hazardous substances not covered by other classes.

4.2 BEFORE PACKING

4.2.1 Information should be provided by the shipper about the properties of the dangerous goods to be handled and their quantity. **The basic items of information necessary for each dangerous substance, material or article to be transported by any mode of transport are the following:**

- the proper shipping name;
- the class or division (and the compatibility group letter for goods of class 1);
- the UN number and the packing group;
- the total quantity of dangerous goods (by volume, mass or net explosive content)

Other elements of information may be requested, depending on the mode of transport (minimum flashpoint for maritime transport, instructions to be followed in case of accident for road transport under the ADR regime, special certificates, e.g. for radioactive material, etc.). The various items of information required under each regulation and applicable during combined transport operations should be provided so that appropriate documentation may be established for each shipment.

4.2.2 The shipper should also ensure that dangerous goods are packaged, marked and labelled in accordance with the applicable regulations. A declaration is usually requested to that effect (IMDG Code, ADR, ADN). Such declaration may be incorporated into or attached to the transport document.

4.2.3 The shipper should also ensure that the goods to be transported are authorized for transport by the modes to be used during the transport operation. For example, self-reacting substances and organic peroxides requiring temperature control are not authorized for transport by rail under the RID regime. Certain types of dangerous goods are not authorized to be transported on-board passenger ships and therefore the stowage requirements of the IMDG Code should be carefully studied, particularly before the consolidation of several shipments in a cargo transport unit for ro-ro transport.

4.2.4 Permanently updated versions of all applicable regulations (IMDG Code, ADR, RID, ADN) should be easily accessible during packing to ensure appropriate checking.

4.2.5 Dangerous goods should only be handled, packed and secured under direct and identifiable supervision of a responsible person who is familiar with the risks involved and knows which emergency measures should be taken.

4.2.6 Suitable measures to prevent fires should be taken, including the prohibition of smoking in the vicinity of dangerous goods.

4.2.7 Packages should be examined and any found to be damaged, leaking or sifting should not be packed into a container or vehicle. Packages showing evidence of staining, etc. should not be packed without first determining that it is safe and acceptable to do so. Water, snow, ice or other matter adhering to packages should be removed before packing. Liquids that have accumulated on drum heads should initially be treated with caution in case they are the result of leakage of contents. If pallets have been contaminated by spilt dangerous goods they should be destroyed by appropriate disposal methods to prevent later misuse.

4.2.8 If dangerous goods are palletized or otherwise unitized they should be compacted and secured in a manner unlikely to damage the individual packages. The materials used to bond the unit load together should be compatible with the substances unitized and retain their efficiency when exposed to moisture, extremes of temperature and sunlight.

4.3 PACKING AND SECURING

4.3.1 Special care should be taken during handling to avoid damage to packages. However, if a package containing dangerous goods is damaged during handling so that the contents leak out, the immediate area should be evacuated until the hazard potential can be assessed. The damaged package should not be shipped. It should be moved to a safe place in accordance with instructions given by a responsible person who is familiar with the risks involved and knows which emergency measures should be taken^{1/}.

4.3.2 If a leakage of dangerous goods presents safety and health hazards such as explosion, spontaneous combustion, poisoning or similar danger, personnel should immediately be moved to a safe place and the emergency response organization notified.

^{1/} The Emergency Procedures for Ships Carrying Dangerous Goods (EmS) and the Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG) in the Supplement to the IMDG Code give further useful advice, but it should be borne in mind that the former may not be appropriate for use on land; **emergency response handbooks, giving emergency response information cross-referenced to the substance United Nations identification number (UN number) are usually available at the national level).**

4.3.3 Dangerous goods should not be packed in the same container with incompatible substances. In some instances even goods of the same class are incompatible with each other and should not be packed in the same container. **The requirements of the IMDG Code concerning the segregation of dangerous goods inside cargo transport units are usually more stringent than those concerning road and rail transport. Whenever a combined transport operation does not include maritime journeys, compliance with the respective inland transport regulations, such as ADR, RID and ADNR is sufficient. If it cannot be however excluded that part of the journey will include maritime shipping, the segregation requirements of the IMDG Code should be strictly complied with.**

4.3.4 When dangerous goods are being handled, the consumption of food and drink should be prohibited unless proper precautions are taken.

4.3.5 Vented packages should be packed with the vents in an upright position and in such a way that the vents will not be blocked.

4.3.6 Dangerous goods consignments which form only part of the load of a container should preferably be packed adjacent to the doors with markings and labels visible. Particular attention is drawn to 3.3.1 concerning the securing of cargo at the rear of a container.

4.3.7 **Whenever authorized under the relevant regulations, certain solid substances and materials classified as dangerous goods may be transported in bulk in freight containers, swap-bodies, road or rail vehicles, and certain liquid substances may be carried in bulk in tank-vehicles or portable tanks; the present guidelines do not cover such the transport of liquid or solid substances in bulk.**

4.4 ON COMPLETION OF PACKING

4.4.1 Placarding

4.4.1.1 Enlarged labels (placards) (minimum size 250 mm x 250 mm) and if applicable **for maritime transport**, "MARINE POLLUTANT" marks (minimum size of a side 250 mm), should be affixed to the exterior surfaces of a cargo transport unit or unit load to provide a warning that the contents of the unit are dangerous goods and present risks, unless the labels or marks affixed to the packages are clearly visible from the exterior of the unit.

4.4.1.2 A cargo transport unit containing dangerous goods or residues of dangerous goods should clearly display placards and, if applicable **for maritime transport**, "MARINE POLLUTANT" marks, as follows:

- .1 a freight container, one on each side and, in addition for maritime transport, one on each end of the unit;
- .2 a railway wagon, at least on each side; and
- .3 any other cargo transport unit, at least on both sides and on the back of the unit.

Placards for the sides of the cargo transport unit should be affixed in such a position that they are not obscured when the unit doors are opened (**for international road transport under the ADR regime, the display of enlarged labels on the vehicles is only required for the transport in bulk**).

4.4.1.3 Whenever dangerous goods present several risks, subsidiary risk placards should be displayed **in addition to primary risk placards**. Cargo transport units containing goods of more than one class however, need not bear a subsidiary risk placard if the hazard represented by that placard is already indicated by a primary risk placard.

4.4.1.4 Where individual schedules in the IMDG Code indicate that no hazard label or class marking is necessary on individual packages, then no such label or class marking is required on the cargo transport unit, provided the UN number is displayed on the unit in accordance with 4.4.1.6.

4.4.1.5 For maritime cargo, any cargo transport unit containing packaged dangerous goods of a single commodity which constitute a full load and for which no placard is required, should be durably marked with the proper shipping name of the contents.

4.4.1.6 Consignments of packaged dangerous goods of a single commodity, with the exception of goods of class 1, which constitute a full load for the cargo transport unit, should have the UN number for the goods displayed in black digits not less than 65 mm high either against a white background in the lower half of the class placard or on an orange rectangular panel not less than 120 mm high and 300 mm wide, with a 10 mm black border, to be placed immediately adjacent to the placard (see annex 2) except when such a placard is not required. In those cases the UN number should be displayed immediately adjacent to the proper shipping name.

4.4.1.7 For the international transport by road under the ADR regime, vehicles carrying dangerous goods should display two rectangular, reflective orange-coloured plates, 40 cm long and not less than 30 cm high, affixed vertically and with black borders not more than 15 mm wide. One should be affixed at the front, the other at the rear of the vehicle, both perpendicular to the longitudinal axis of the vehicle. They should be clearly visible.

4.4.1.8 For radioactive materials special requirements apply (see, for example, section 6.5 of the introduction to class 7 in the IMDG Code).

4.4.2 Certification

4.4.2.1 For maritime transport, Regulation 5 of Chapter VII of the International Convention for the Safety of Life at Sea (SOLAS, 1974, as amended) requires that persons responsible for the packing of dangerous goods in a freight container or road vehicle shall provide a signed container packing certificate or vehicle packing declaration stating that the cargo in the transport unit has been properly packed and secured and that all applicable transport requirements are met.

4.4.2.2 The IMDG Code recommends the following declaration:

The vehicle or freight container was clean, dry and apparently fit to receive the goods.

If the consignments include goods of class 1, except division 1.4, the vehicle or freight container is structurally serviceable in conformity with section 12 of the introduction to class 1 of the IMDG Code.

No incompatible goods have been loaded into the vehicle or freight container (unless approved by the competent authority concerned in accordance with 12.2.1 or 17.6.3.1 of the General Introduction to the IMDG Code).

All packages have been externally inspected for damage, leakage or sifting, and only sound packages have been loaded.

All packages have been properly loaded into the vehicle or freight container and secured.

When dangerous goods are transported in bulk packaging, the cargo has been evenly distributed.

The vehicle or freight container and the packages therein are properly marked, labelled and placarded.

When solid carbon dioxide (CO₂ - dry ice) is used for cooling purposes, the vehicle or freight container is externally marked or labelled in a conspicuous place, e.g. at the door end, with the words:

"DANGEROUS CO₂ - GAS (DRY ICE) INSIDE.
VENTILATE THOROUGHLY BEFORE ENTERING".

The dangerous goods declaration required in subsection 9.4 of the General Introduction to the IMDG Code has been received for each dangerous goods consignment loaded in the vehicle or freight container.

4.4.2.3 Such a certificate is not required under the RID, ADR and ADN regimes, even though it may be requested for inland domestic transport in certain countries. Furthermore, it should be borne in mind that this certificate will be needed if the transport operation includes maritime journeys. It will then need to be provided prior to embarkment as port authorities, berth operators and shipmasters may wish to sight the Container Packing Certificate/Vehicle Declaration (or a copy) before accepting containers or vehicles carrying dangerous goods into their premises or aboard their ship.

4.4.2.4 For international road transport under the ADR regime, when several pieces of dangerous goods are packed together in a single container, the consignor is requested to declare that such mixed packaging is not prohibited.

4.4.2.5 The functions of the dangerous goods declaration (**see 4.2.2**) and of the Container Packing Certificate/Vehicle Declaration, may be incorporated into a single document; if not, these documents should be attached one to the other. If these functions are incorporated into a single document, e.g. a dangerous goods declaration, a shipping note, etc., the inclusion of a phrase such as "It is declared that the loading of the goods into the [insert vehicle or freight container as appropriate] has been carried out in accordance with the provisions of section 17 of the General Introduction to the IMDG Code" may suffice.

4.4.3 The transport of some types of dangerous goods may require that the container doors are locked and sealed. In such cases the keys should be readily available at the port and placed aboard the ship.

4.4.4 Dangerous goods should not be stored in combined transport terminals for more than 24 hours, unless there exist special provisions at the terminals for the storage of dangerous goods. Therefore, any shipper of dangerous goods should either ascertain that such storage facilities have been provided or he should deliver the dangerous goods at the day of departure and pick them up at the day of arrival.

4.4.5 Pick-up of containers or swap-bodies carrying dangerous goods in inland terminals has to be executed by a driver who has been well instructed. The driver should possess a driver training certificate proving that he is allowed to drive a vehicle carrying dangerous goods of the classes contained in the cargo transport unit. Before departure, he should be provided with all relevant dangerous goods documentation as well as with written instructions on action to be taken in case of accidents corresponding to the dangerous goods transported.

5 ADVICE ON RECEIPT OF CONTAINERS OR VEHICLES

5.0 When receiving a container or swap-body, the receiver should ascertain that the load unit is externally in good shape and without damage. If there is any damage, the receiver should notify this together with the operator's personnel prior to taking the container into his yard. Specific attention must be paid to such damages that may have influenced the shape of the cargo within the container. If the receiver detects any damage during the discharge of the container, he should immediately stop the discharge operation and call for a representative of the transport operator to supervise the further discharge and to determine the volume and possible source of the damages.

5.1 Persons opening a container or vehicle should be aware of the risk of cargo falling out. Doors, when opened, should be secured in the fully-opened position.

5.2 A container or vehicle which carries dangerous goods, or in which expandable refrigerants have been used, or which has been shipped under fumigation, may present a special risk of dangerous atmosphere, perhaps flammable, explosive, asphyxiant or poisonous. In such a case the container or vehicle should be ventilated by leaving it with its doors open for a sufficient time before allowing personnel to enter. Where flammable goods are concerned, there should be no sources of ignition in the vicinity.

5.3 If there is a particular reason to suspect danger, e.g. because of damage to packages or the presence of fumigants, expert advice should be sought before unpacking of the unit commences.

5.4 After a container or vehicle with dangerous goods has been unpacked, particular care should be taken to ensure that no hazard remains. This may require special cleaning, particularly if poisonous spillage has occurred or is suspected. When the container or vehicle offers no further hazard, the dangerous goods placards, orange panels and "MARINE POLLUTANT" and any other marks should be removed, masked or otherwise obliterated.

5.5 If a container shows signs of abnormally high temperatures it should be moved to a safe place while the fire services are notified. Care should be taken to ensure that the fire-fighting methods used are suitable for the cargo in the unit.

5.6 Attention is drawn to the fact that the consignee is normally obliged to return a container, after discharge, clean and suitable for the transport of every kind of cargo. This applies especially when dangerous goods or obnoxious cargoes have been transported. **A pamphlet on this subject is under preparation by ICHCA^{1/}.**

5.7 The consignee shall keep in mind that he may be held responsible for all damages to the container, other than those that have been officially observed and endorsed by the operator prior to the transfer of the unit to the consignee.

6 BASIC PRINCIPLES ON THE SAFE HANDLING AND SECURING OF CONTAINERS^{2/}

6.1 GENERAL

6.1.1 Before handling a freight container, the handling staff shall make certain whether the container is empty or loaded; unless otherwise ascertained, a container should be treated as loaded.

^{1/} International Cargo-Handling Co-ordination Association (ICHCA).
^{2/} based on International Standard ISO 3874 Series 1 freight containers
- Handling and Securing).

6.2 LIFTING

6.2.1 Before lifting a container, the handling staff should ascertain that the lifting equipment is safely attached to the container and that the container is free standing.

6.2.2 Not all lifting equipment is suitable for all types and all sizes of containers. Before using any type of such equipment, the lifting staff should ascertain that the type of lifting equipment selected is suitable for the container. International Standard ISO 3874^{1/} gives all necessary details for such a decision.

6.2.3 Some lifting features of the container may only be used when the container is empty ("tare condition"). This occurs most frequently with fork lift pockets. Such features are marked accordingly on the container. This limitation has to be followed strictly, otherwise very severe accidents may occur.

6.2.4 Containers with or without fork lift pockets should, under no circumstances, be lifted with forks applied under the base of the container.

6.2.5 Containers without a grappler lifting area should, under no circumstances, be lifted by means of grappler arms.

6.3 CONTAINERS ON GROUND

6.3.1 When the container is sitting on ground, a firm, flat and drained surface should be provided, clear of obstructions and projections. On the ground, the container shall be supported by the four bottom corner fittings only.

6.3.2 When stacking containers, the lower corner fitting bottom surface of the top container shall completely have contact with the top corner fitting upward surface of the lower container. A shift up to 25 mm laterally and 38 mm longitudinally may be tolerated.

6.3.3 A container stack will be subject to forces by heavy winds. This might lead to sliding and toppling of containers. Stacks of empty containers will be more subject to such dangers than stacks of loaded containers. The higher the stack, the greater the danger.

^{1/} International Standardization Organization (ISO).

6.4 CONTAINERS ON VEHICLES

6.4.1 Containers should be firmly secured on vehicles prior to starting to move the vehicle. The most appropriate point of fixing is the bottom corner fitting of the container. Before and during transport, the correct fixing of the container on the vehicle should be checked.

6.4.2 Before lifting a container off a vehicle, it should be ascertained that all fixing features have been unfastened.

6.4.3 The correct loading and securing of a container on board of a seagoing ship is a most difficult task that needs experience and skill. It should never be allowed that such tasks are executed by personnel that are not fully trained in these operations.

6.4.4 For the transport on public roads or by rail, the container should be fixed to the road or rail vehicle by all bottom corner fittings. The main forces during the transport operation should be introduced onto the container through these bottom corner fittings. Some additional forces may be transferred between the road vehicle chassis or rail-car surface and the container bottom through load transfer areas designed in the container bottom and in the vehicle surface. The securing device on the container vehicle may be a twist-lock, a securing cone, or securing guides. All such securing features shall be designed in such a way that the position ("open" or "locked") of such securing devices is readily apparent.

Annex 1

Condensation

1. Goods in transit may be affected by the conditions to which they are subjected. These conditions may include changes in temperature and humidity and particularly cyclic changes that may be encountered. An understanding of condensation phenomena is desirable because condensation may lead to such damage as rust, discoloration, dislodging of labels, collapse of fibreboard packages or mould formation.
2. Solar radiation can produce air temperatures under the inner surfaces of a container which are significantly higher than external air temperatures, while radiation at night can cause such temperatures to fall well below the external temperatures. The combination of these effects can result in a range of day and night cyclic temperature variations in the air adjacent to the inner surfaces of a container which is greater than the corresponding range of temperatures just outside.
3. Goods closest to the walls or roof will be more affected by external variations than those in the centre of a container. If the possible extent of temperature variations or their full significance is not known, advice should be obtained from specialists.
4. Under the circumstances described, condensation may occur either on the surface of the cargo sweat) or on the inside surfaces of a container (container sweat) both during transport or when the container is opened for discharge.
5. The main factors leading to condensation inside a container are:
 - .1 sources of moisture inside the container which, depending on ambient temperature conditions, will affect the moisture content of the atmosphere in the container;
 - .2 a difference between the temperature of the atmosphere within the container and the surface temperature of either the cargo or the inner surfaces of the container itself; and
 - .3 changes in the temperature of the outer surface of the container which affect the two factors above.
6. Warming the air in a container causes it to absorb moisture from packagings or any other source. Cooling it below its dewpoint^{1/} causes condensation.

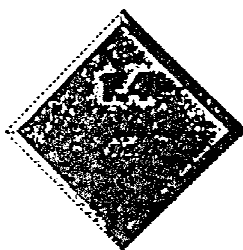
^{1/} Dewpoint is the temperature at which air saturated with moisture at the prevailing atmospheric pressure will start to shed moisture by condensation.

7. If, after high humidity has been established inside a container, the outside of the container is cooled, then the temperature of the container surface may fall below the dewpoint of the air inside it. Under these circumstances moisture will form on the inner surfaces of the container. After forming under the roof, it may drop on to the cargo. Cyclical repetition of the cargo or container sweat phenomena can result in a greater degree of damage.

8. Condensation can also occur immediately after the doors of a container are opened if the air inside the container is humid and the outside air is relatively cool. Such conditions can produce a fog and even precipitation but, because this phenomenon usually occurs only once, it seldom results in serious damage.

Annex 2

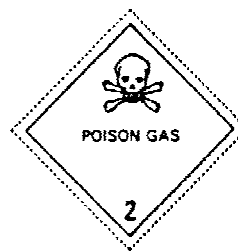
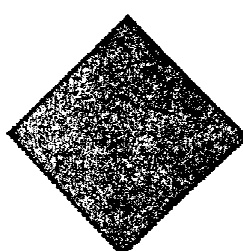
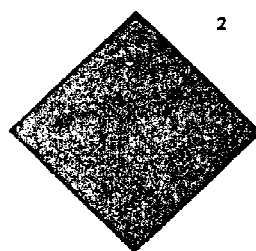
1. Labels, placards and MARINE POLLUTANT mark



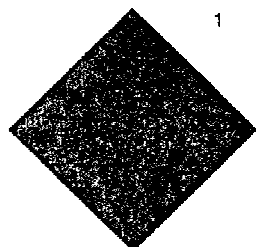
- The appropriate division number and compatibility group are to be placed in this location, e.g. 1.1, D.
- The appropriate compatibility group is to be placed in this location, e.g. G.¹



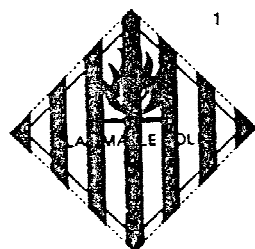
Explosive subsidiary risk label for self-reactive substances in class 4.1 and organic peroxides with explosive properties. Refer to paragraph 1.5 of the introduction to class 4.1 and paragraph 5.1.1 of the introduction to class 5.2.



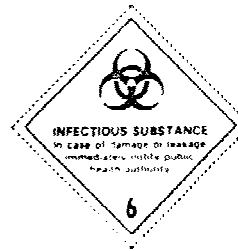
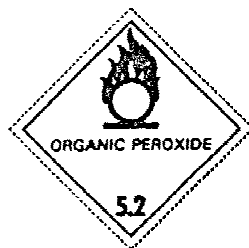
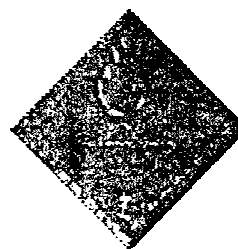
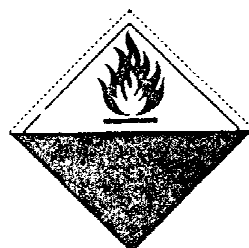
- ¹ For goods of class 1 in division 1.4, compatibility group S, each package may alternatively be marked **1.4 S**.
- ² Flammable has the same meaning as inflammable.



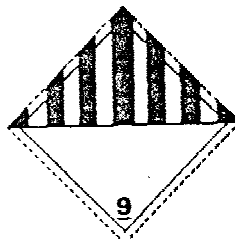
1



1



¹ Flammable has the same meaning as inflammable.



MARK



Dimensions of labels, placards and MARINE POLLUTANT mark

Labels should not be less than 100 mm × 100 mm except in the case of packages which, because of their size, can only bear small labels.

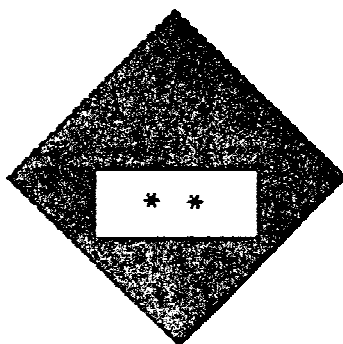
Placards should not be less than 250 mm × 250 mm.

The MARINE POLLUTANT mark is required for harmful substances (environmentally hazardous substances) according to Annex III of MARPOL 73/78, as amended. The mark should be in a contrasting colour to the packaging, or, when used as a sticker, coloured black and white. For packages, the triangular shaped mark should have sides of at least 100 mm except in the case of packages which, because of their size, can only bear smaller marks. For cargo transport units this dimension should be not less than 250 mm.

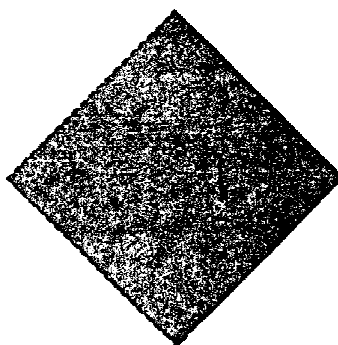
For detailed requirements see sections 7 and 8 of the General Introduction to the International Maritime Dangerous Goods Code (IMDG Code).

2. Samples of the display of UN numbers on placards for freight containers and vehicles

ALTERNATIVE 1

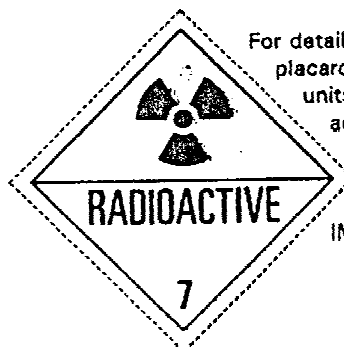


ALTERNATIVE 2



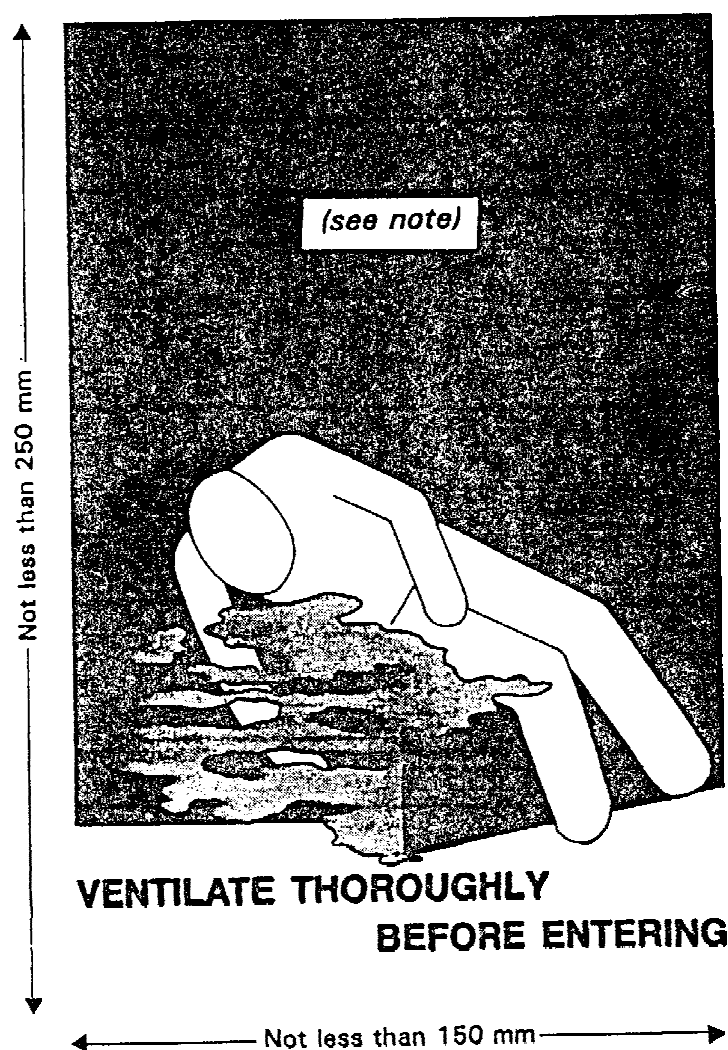
- * Location of class number
- ** Location of UN number

FOR CLASS 7



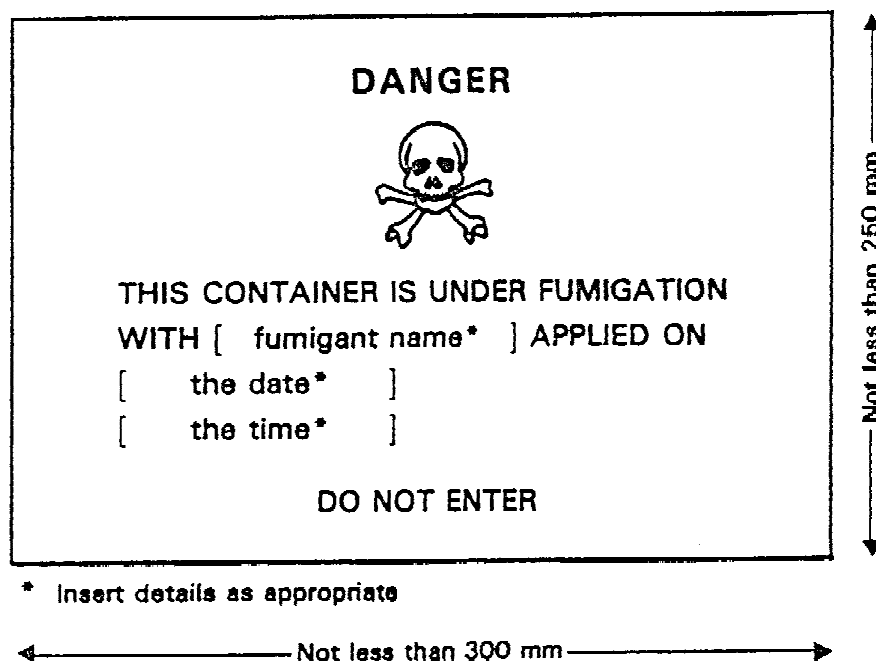
For detailed requirements for placarding cargo transport units containing radioactive materials, see subsection 6.5 of the introduction to class 7 in the IMDG Code.

3. Warning label for dry ice or other expendable refrigerant used for cooling purposes



Note: The text under "WARNING" should refer to the refrigerant gas used.

4. Warning label for containers under fumigation



Annex 3

Measures to prevent overloading of containers

1. Occupational safety hazards are caused by overweight containers in a multimodal transport chain; these hazards include:

.1 risks to ship and shoreside handlers in the event of structural failure of the containers;

.2 risks to container handlers and plant operators, particularly fork lift truck drivers whose vehicles may be damaged or may become unstable;

.3 risks leading to accidents of road and rail carriages when the overloaded container exceeds the maximum permissible weight of the rolling stock. This risk is aggravated by the fact that the road vehicle driver is often not aware of his vehicle being overloaded and does not adjust his driving habits accordingly. Further risk arose from the special conditions in intermodal road/rail transport in Europe, as rail-cars in service often do not provide for a large technical safety margin.

2. The principle hazard is due to accidents involving loading or unloading a container on or off a ship and container handling equipment in the terminal area, especially when containers are to be stacked for storage pending shipment or dispatch to consignees.

Note: When high density goods, such as heavy machinery or metal ingots, are shipped in containers, the selection of the type and capacity of the container should be taken into account to prevent overloading.

3 Most cranes can be expected to have weight limit controls but, as these are designed to prevent overstressing of the crane, they will not necessarily assist in the detection of overweight containers.

4. When an overweight container is off loaded from a ship, its condition may only be discovered upon being removed for stacking in the terminal area and the handling equipment being of inadequate lifting capacity. In addition, container handling equipment, in some ports, may not be available for handling high capacity containers.

5. The problem of overweight containers should be properly addressed at the initial phase of packing the container. Packing of cargo freight containers, either at the manufacturing or producing premises, consolidation depots, or consignor's warehouse, should be under the supervision of trained operatives who are provided with adequate information on the cargo to be packed and who possess sufficient authority to control the operation to prevent overweight containers. Some countries have introduced legislative rules that make such information transmittal obligatory.

6. Packing should be carried out in accordance with procedures established by the management of the packing firm or organization, which should address all relevant aspects of the operation, including container selection, inspection and preparation, stowage, segregation and distribution, blocking, bracing and securing, and documentation. Appropriate procedures are set out in these Guidelines.

7. In view of the above, a number of steps can be taken to prevent the overloading of containers; these include:

- .1 taking proper measures to ensure that:
 - .1.1 the cargo in the container has been properly packed, blocked, braced and secured;
 - .1.2 the distribution of cargo within the container has been arranged so that the centre of gravity is reasonably central with regard to length and breadth of the container; and
 - .1.3 the maximum gross mass of the container has not been exceeded;
- .2 where possible, a weight declaration or weighbridge certificate should be included in or with the container documentation (**such a document may be prescribed by law in some countries**); and
- .3 where practicable, load detection devices should be fitted to container handling equipment, in particular to fork lift trucks and side loaders used to transport containers.

8. By taking these steps, the problem associated with overloading of containers should be prevented. However, if a container is still found to be overloaded, it should be removed from service until it can be restored to safe handling conditions.

Annex 4

List of competent international organizations

Further information, particularly on regulations and legal provisions at the international level, could be obtained from the organizations listed below:

United Nations Economic Commission for Europe (ECE)

Transport Division
Palais des Nations
CH-1211 Geneva 10
Switzerland
Fax: +41-22-9170039

International Maritime Organization (IMO)

Cargoes and Facilitation Section
4 Albert Embankment
UK-London SE1 7SR
Fax: +44-71-587321

International Labour Office (ILO)

Maritime Industries Branch
4, route des Morillons
CH-1211 Geneva
Fax: +41-22-799-7050

Central Commission of Navigation on the Rhine (CCNR)

2, place de la République
F-67082 Strasbourg
Fax: +33-88-321072

Danube Commission (CD)

25, rue Benczur
H-1068 Budapest
Fax: +36-1-268-1980

International Organization for Standardization (ISO)

1-3 Rue de Varembe
CH-1211 Geneva
Fax: +41-22-733-3430

European Standardization Committee (CEN)

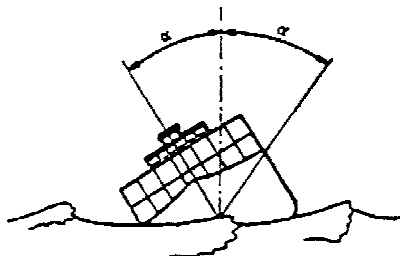
Rue de Strassart 36
B-1050 Bruxelles
Fax: +32-2-519-6819

International Cargo-Handling Co-ordination Association (ICHCA)

71 Bondway
UK-London SW8 1SH
Fax: +44-71-8201-703

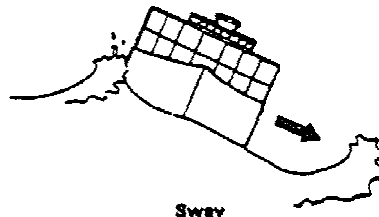
Appendix

This appendix contains a list of drawings with an illustration of "DO" and "DON'T". Such illustrations could be added to the compendium to underline its practical dimension.

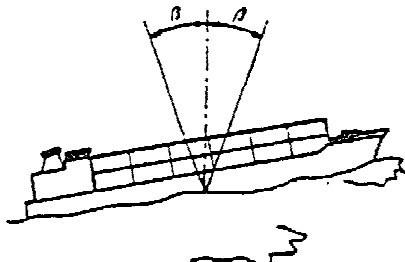


Roll

Brief sideways motion along slope of the sea surface

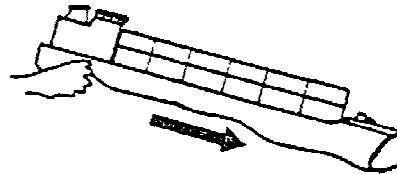


Sway



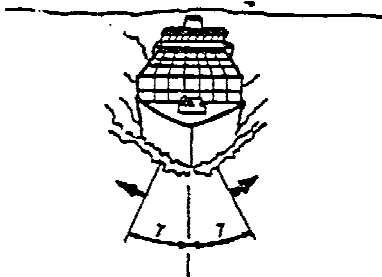
Pitch

Brief, additional forward motion along slope of sea surface



Surge

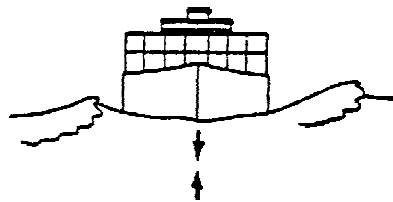
Momentary deviation from projected course



Yaw

a) Rotational motion

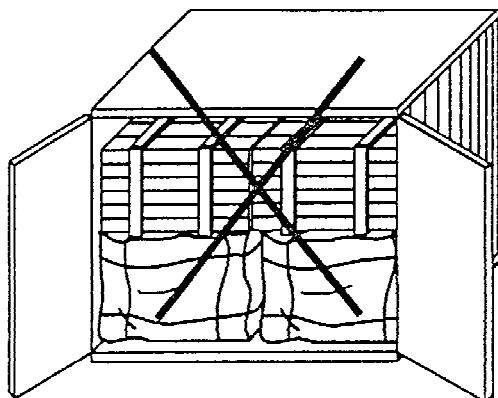
Brief vertical motion due to rise and fall of sea surface



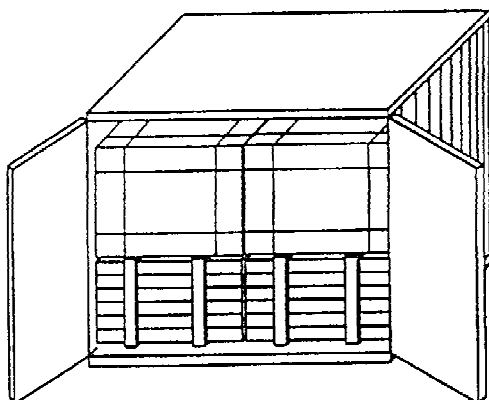
Heave

b) Linear motion

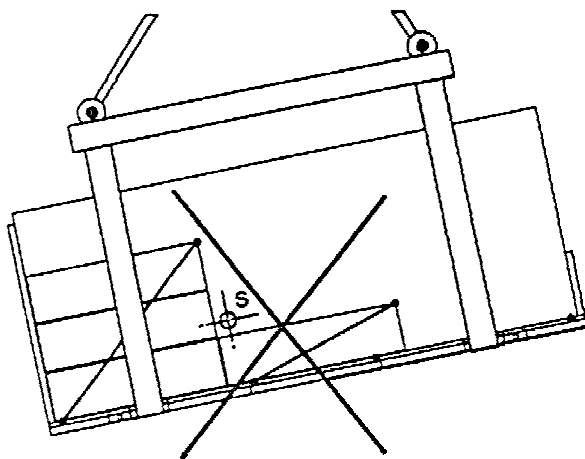
Examples of ship and Container movement at sea



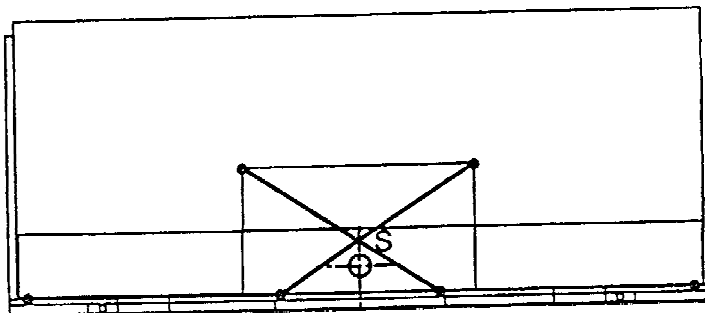
Don't load heavy items on top of
light ones



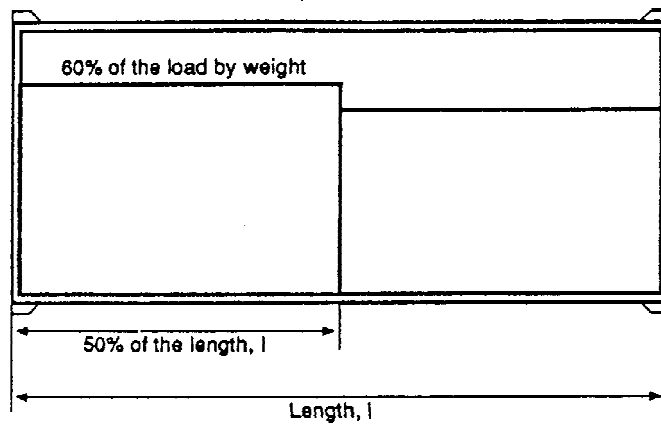
Do load lightweight items on top of
heavy ones



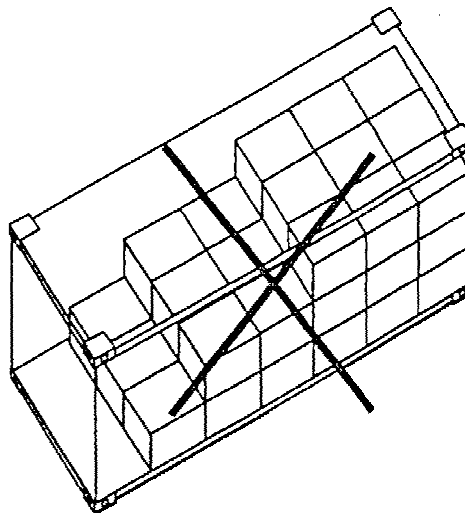
Don't load with excentric load
distribution



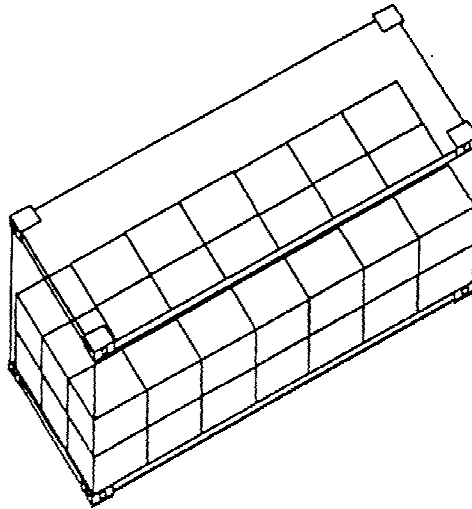
Do load in the centre of the
container



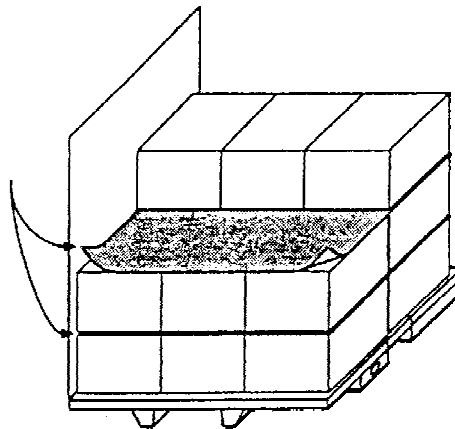
Even load distribution:
not more than 60 % in one half of
the container



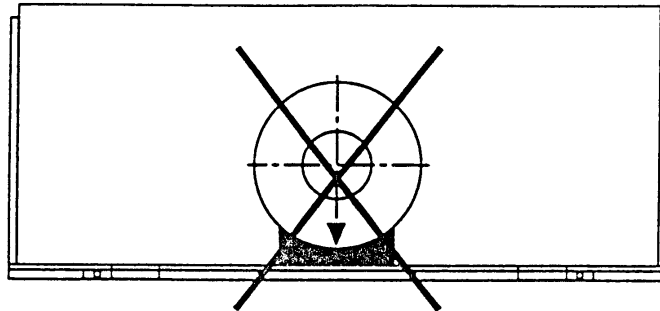
Don't built up irregular layers of
packages



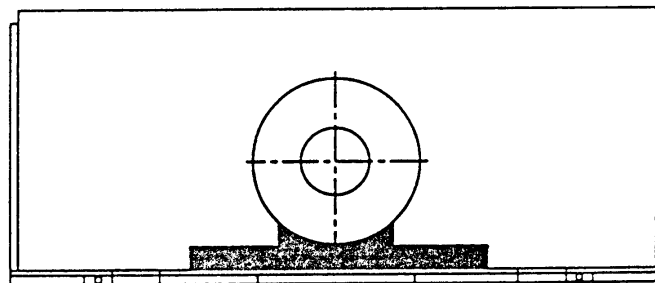
Do exercise a block model in
stowing of packages



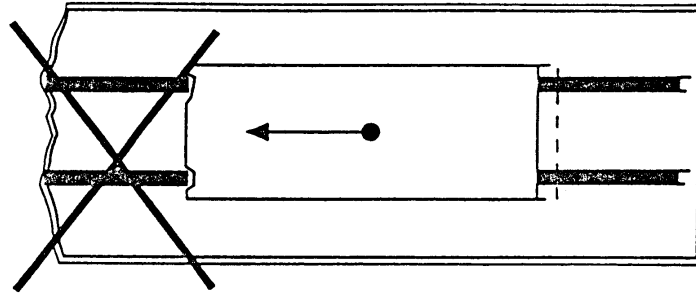
Do use adhesive surface material
against sliding of packages



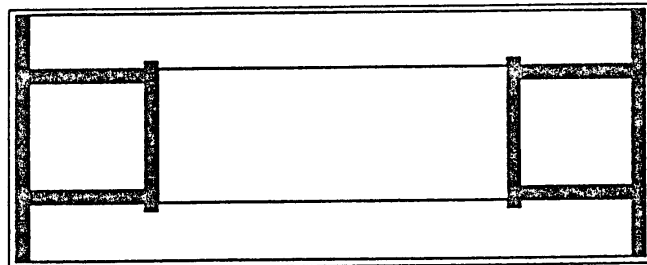
Don't concentrate heavy loads on
small areas of the floor



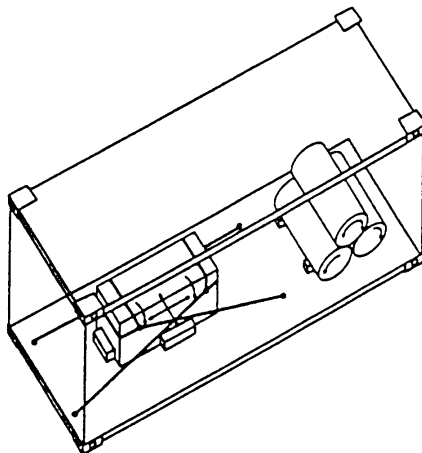
Do distribute heavy loads over the
entire floor area



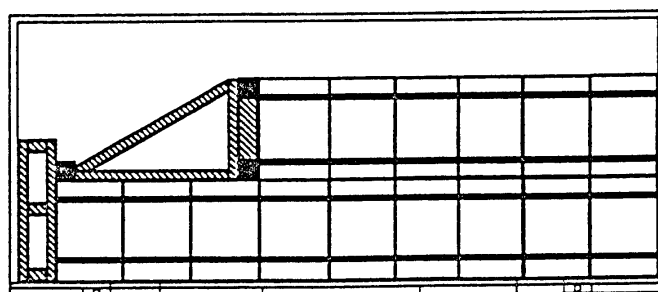
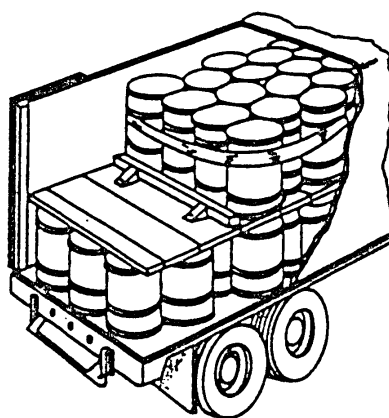
Don't load with devices that produce heavy forces into small areas of the container inside structure



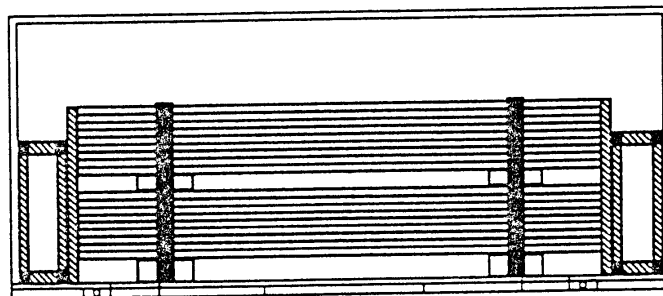
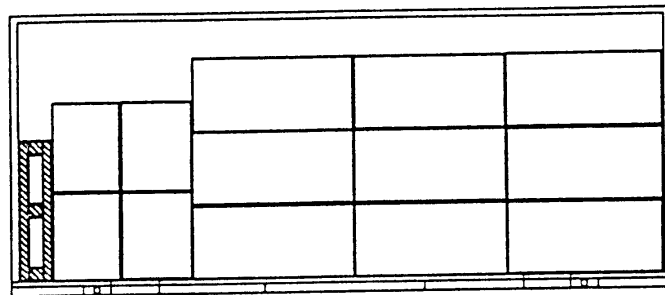
Do secure loads in a way that forces are distributed over a large area



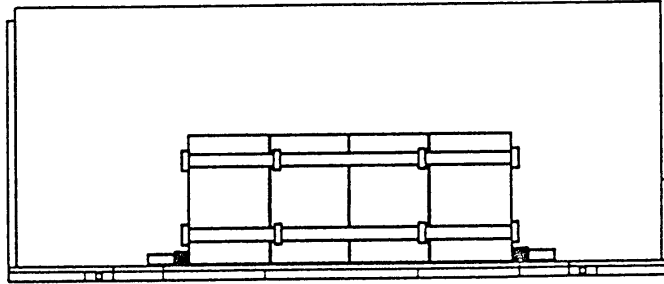
Do secure each single loaded items
independently



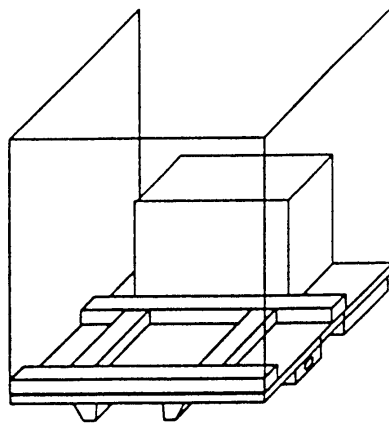
Do secure the upper layer
adequately



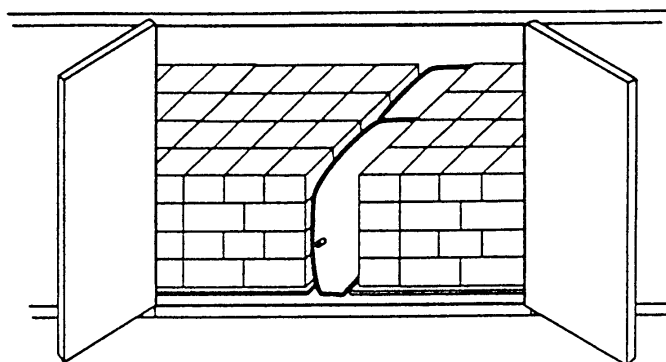
Fill all spaces between load and
container wall by securing means



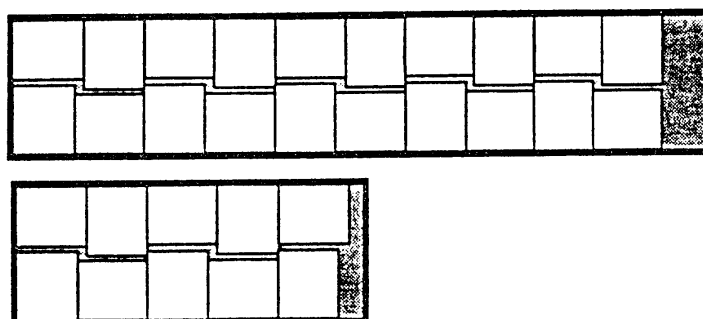
Do secure adequately against
tipping



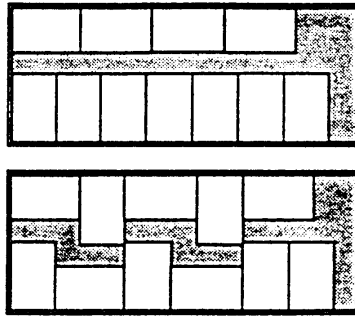
Example for Wooden dunnage



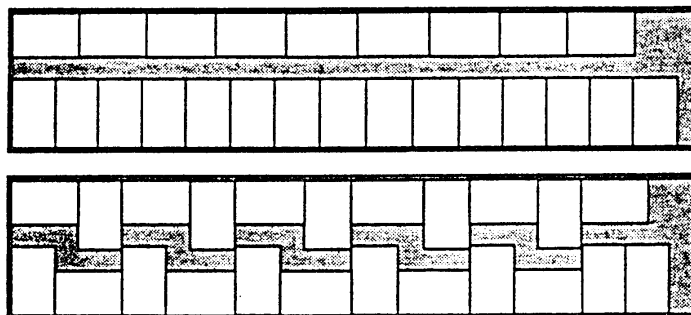
Example for air bag use



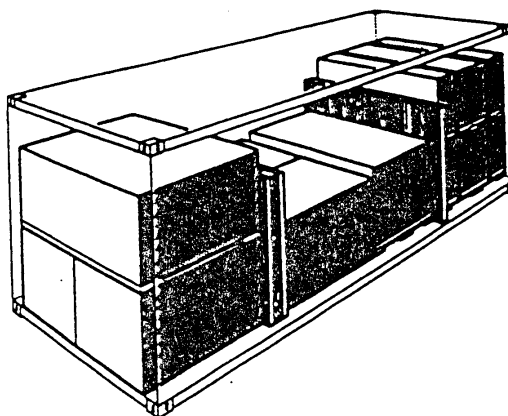
Stowing 1000 x 1200 mm unit
Loads in 20' and 40' containers



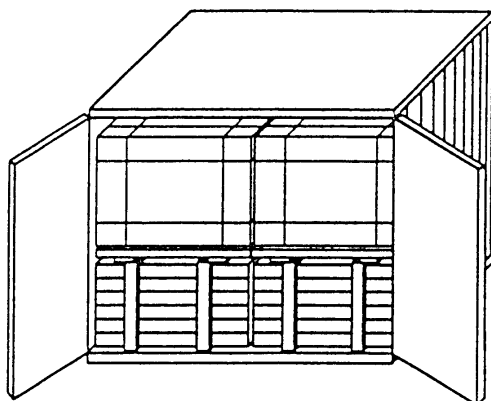
Stowing 800 x 1200 mm unit
Loads in 20' containers



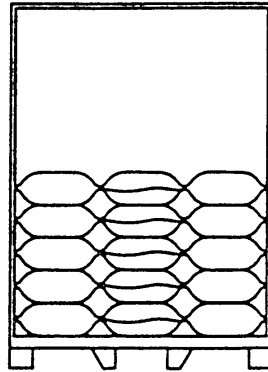
Stowing 800 x 1200 mm unit
Loads in 40' containers



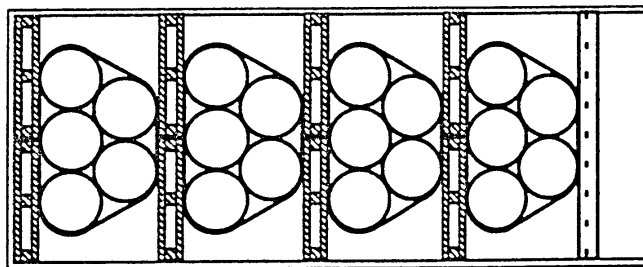
Load securing by vertical separators



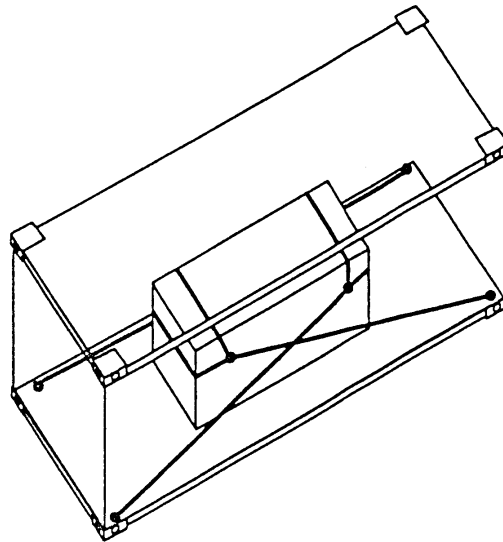
Load securing by interim floor layers



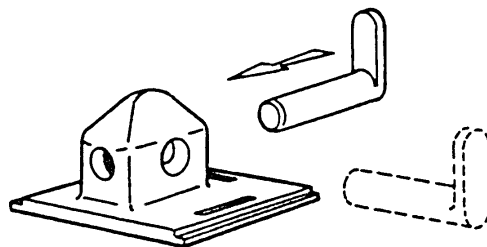
Securing of cargo bags



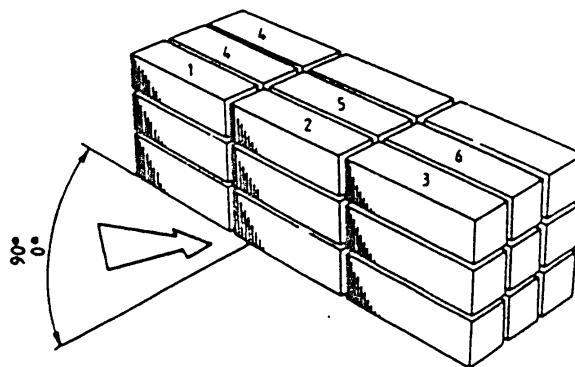
Securing of drums



Correct securing of heavy single items



Twistlock fastening on vehicles



Wind effect on container stacks

Container 1: most likely to be displaced by Wind
Container 2: second most likely to be displaced
by Wind
